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TRAINING THE PROBLEM SOLVING SKILL BY IMPLEMENTATION GUIDED DISCOVERY LEARNING MODEL AT THE REACTION RATE

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Abstract

Guided discovery learning is a learning model that encourages students to discover concepts and principles for themselves that emphasize a student-centered learning experience. This study aims to describe the effectiveness of guided discovery learning model to training problem solving skills on reaction rate material conducted in class XI Mipa 4 SMAN 1 Manyar Gresik. The research method which is used is one group pretest posttest design. Learning tools used include syllabus, lesson plan, and worksheet. Based on the results of the research indicates that: 1) Guided discovery learning model is implemented with percentage of > 61%. 2) Student problem solving skills after implementation the guided discovery learning model successfully trained from N-gain obtained increased in each indicator ie problem representation, planning, implementation and monitoring respectively of 0.92; 0.95; 0.96; 0.86. 3.) Positive responses of students during the learning process on all questions earn a percentage of $\geq$ 90% are in very strong category. This suggests that the guided discovery learning model is effective for training problem solving skills on reaction rate material.

Keyword: *guided discovery learning, problem solving skills, reaction rate*

INTRODUCTION

Education has a very important meaning in life, both in the lives of individuals, nations and countries. Indicators of measuring progress of a nation can be measured from education. Education is currently being developed to face future demands involving life competitiveness and will have a direct impact on the demands of human resource improvement, therefore the government proclaims the 2013 curriculum which is then refined in the revised 2013 curriculum. The development of information and communication technology in various aspects of life currently plays a strategic role in the 21st century. Analysis of the development of the 21st century and identification in the life of the nation that requires certain skills to produce new conditions. These conditions include: (1) global skills (global awareness and independence), (2) global cooperation (cooperative skills, mastery of ITC), (3) information growth (critical thinking skills and problem solving), (4) development work and career (innovative skills that are flexible and adaptable), (5) economic development (information-responsive skills) [1]. These competencies are the 21st Century Skills. The 21st century competency framework becomes a foothold in the development of the 2013 curriculum designed to anticipate the needs of 21st century competencies [2].

When looking at the demands of the change of the 21st century human mindset and the theme of curriculum development of 2013 mentioned above, the competencies that must be developed include problem solving skills. John Dewey argues that problem solving is a deliberate process consisting of problems, developing hypotheses to solve problems, testing different hypotheses, and choosing the most appropriate alternative [3]. Based on the study put forward by John Dewey, it can be measured by problem solving skills indicator consisting of problem representation, planning, implementation, monitoring[4]. Thus problem-solving skills must be self-built by students through active involvement in learning. The trained problem solving skills will be contained in the worksheet. Worksheet is a teaching material that is ready to be used by the teacher contains the tasks that must be done by students, so that students will gain experience learn independently and learn to understand the those tasks [5].

Based on the results of interviews with teachers SMAN 1 Manyar on August 8, 2017 note that not all students reach the minimal complete criteria on the reaction rate material. One of the obstacles or difficulties experienced in chemistry teaching is that not all students are enthusiastic in receiving learning materials, although teachers have attempted to use various teaching methods such as discussion methods as well as information or direct instruction. Moreover, 51.72% of reaction rate material is considered difficult by students. The cause of the difficulties experienced by students on the reaction rate material with a percentage of 31.03% is reaction rate material that has abstract concept [6]. A total of 52% of students wanted a experiment method which meant that they found their own concepts. Experiment activities are able to transform abstract concepts into a more concrete [6]. Therefore the material of the reaction rate is chosen by the researchers seen from the level of difficulty of the material.

In addition it is known that teachers often teach problem skills and the results almost 80% of students have the ability to solve problems. However, in contrast to the results of a pre-study questionnaire XII Mipa 8 SMAN 1 Manyar it is known that teachers rarely teach problem-solving skills supported by initial skills test results indicate that, scores obtained by students <25 are far below minimum complete criteria standards. In line with the description of the results of pre-research efforts that can be done to make students master the basic competencies listed, generate student interest in learning chemistry, make students find the concept for himself, and trained problem solving skills it is necessary a model of learning, invention (guided discovery).

According to Carin the guided discovery model is a learning model that trains and guides students to learn, gain knowledge, and build concepts that they find for themselves [7]. Discovery learning is a learning model that organizes the pursuit in such a way that students acquire knowledge that they have not known before through notifications, but finds themselves [8]. The guided discovery learning model has six phases: 1) convey motivation, purpose, and orientation to a problem. 2) Explain the steps of investigation, 3) Conduct investigation activities (experiment), 4) Conduct observation and data collection, 5) Present the results of the investigation, 6) Evaluate the activities of the experiment and provide feedback [9]. Students will have the opportunity to develop all the abilities they have including the ability to solve problems with problem encountered. Therefore students need to experience an activity designed so that they are able to discover and understand concepts, theories, laws and solve the problems of everyday life.

METHOD

The type of research which is used is pre-experiment. This research was conducted in XI MIPA 4 SMAN 1 Manyar Gresik in the odd semester of 2017/2018 which is amounted to 33 students on reaction rate material.

This research was conducted to find the concept discovery. The study design used One group pretest posttest design. Details of the research procedure consist of the preparation phase of the research, the stage of research implementation, the final stage.

Learning device used in this research is syllabus, lesson plan, student book, worksheet. The research instrument includes a review sheet, validation sheet, observation sheet of learning model implementation, student activity observation sheet, problem solving skill test, study result test sheet, and student response questionnaire.

Data collection techniques that are arranged in this research are the technique of giving test, observation technique, questionnaire.

Technique of giving test in this research is used to know problem solving skill of student. Analysis of problem solving skill data was based on scores obtained by students before and after learning using guided discovery learning model.

Pretest and posttest results were analyzed to determine the problem solving skills improvement using N-gain formula

Students are said to be trained if n-gain scores is obtained ≥ 0.30 at medium and high criteria [10].

RESULTS AND DISCUSSION

The Implementation of Guided Discovery Learning Model

The data on the implementation of the Guided Discovery Learning model is derived from observations by two observers in class consist of one SMAN 1 Manyar chemistry teacher and one Unesa chemistry student using the learning model instrument. The observed aspect is the compatibility between the syntax of learning designed with its implementation. All the learning phases can be done well for three meetings can be seen in Figure 1 below:

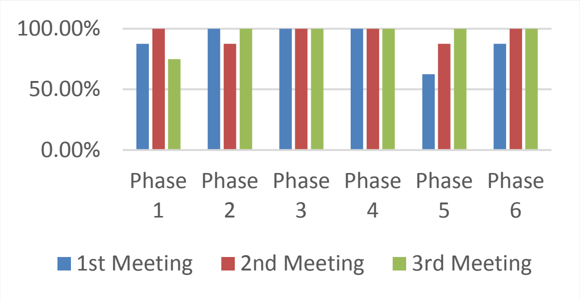


Figure 1 Bar Diagram of the Implementation of Guided Discovery Learning Model

Phase 1 is to convey motivation, purpose, and orientation to a problem. This phase is a preliminary activity. This activity raises questions given to students to review previous knowledge and motivate students by showing the phenomenon they will learn. One way to activate student motivation is by telling them why they are learning and what they will learn [11]. The implementation of the Guided Discovery Learning model in Phase 1 for three consecutive meetings was 87.5%, 100%, 75%.

Phase 2 is to explain the steps of investigation. This phase begins with teachers dividing students into 6 heterogeneous groups, then distributing worksheet to each group. Worksheet is used to training problem solving skills, so that in the worksheet is contained indicators of problem solving skills. Students are led to discover their own concepts and principles. This activity is in line with the 2013 curriculum which states that students should be actively involved in finding problems, so that teachers give students the opportunity to convey their ideas and not give ideas and theories directly [12]. Percentage of implementation in this phase for three consecutive meetings are 100%, 87.5%, 100%.

Phase 3 is conducting investigation activities (experiment). Students perform experimrnt activities in groups. This activity is done in an orderly manner because students follow the steps they have set up to do the experiment. This experimrnt activity makes students enthusiastic in the implementation, so the results obtained are also good. The first meeting until the last meeting conducts the lab according to the topics discussed in each meeting. All meetings earn a percentage of 100%

Phase 4 is to observe and collect data. Students will write and analyze experimental results that have been done on worksheet. This activity is conducted in a discussion by connecting what has been obtained through experiment activities with theories contained in the literature. The literature used is like a student's chemistry book and the internet, making it easier for students to analyze the results. Percentage for all three meetings in this phase is 100% with very good category. This shows that the teacher performed this activity very well.

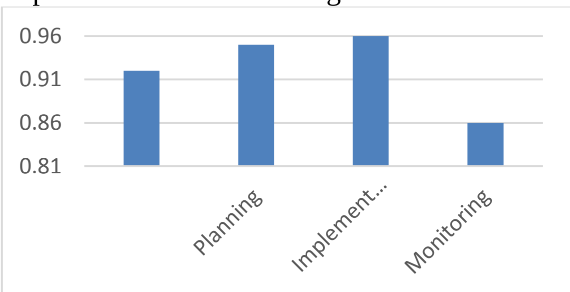
Phase 5 is present the results of the investigation. The presentation of the results of the discussions was carried out by each group to elicit responses from other groups. This activity needs to be done so that the answers obtained by students get feedback from students or clarification from the teacher, so that students understand the truth of the concept they find. Phase 5 at the first meeting was only in the good category of 62.5% compared to the next meeting which was in the excellent category of 87.5% and 100%.

Phase 6 is to evaluate the experimental activities and provide feedback. The closing activities are included in phase 6. Students are able to summarize the materials and student-centered learning can be done well so that the teacher's is only as a facilitator. This phase earned a percentage at the first meeting of 87.5% and in the next two meetings of 100% which are all in very good category.

Problem Solving Skills

Problem-solving skills that are measured include problem representation, planning, implementation, and monitoring. Implementation of the learning model on training problem solving skills is measured using a problem solving skills instrument. The test is measured twice in every meeting, the pretest done before the students follow the learning process and posttest done at the end of the learning. The meeting was held three times with a time allocation of 2 x 45 minutes in each meeting.

In general, problem solving skills can be trained well as it improves on all indicators from pretest to posttest can be seen in Figure 2



. **Figure 2** Bar Chart Increased N-gain Problem Solving Skills in all indicators

Based on the above figure can be seen from the N-gain in the indicator of problem representation, planning, implementation, and monitoring in a row of 0.92; 0.95; 0.96; 0.86. Based on the criteria according to Hake all the average N-gain achieved in each meeting is in the high category. This proves that the implementation of guided discovery learning model can solve problem solving skills.

All indicators are improving well. This can be seen from the value of pretest to posttest which increased significantly. The representation indicators of the problem can be trained well. They were able to do well because they had been trained for three meetings. Planning indicators can be seen from students able to plan activities to solve problems ranging from formulating hypotheses, identifying variables, and writing tools, materials and procedures with their own sentences based on phenomena. Although at first they have not understood and can not even plan a problem solving but with continuous training they become able and trained. Almost all of the student niai increased from pretest to posttest on the planning indicators. Increased student scores are supported by discussions built by very active students in each group during the learning progress. Discussion methods have the main purpose of improving students' thinking skills and helping students learn various skills and thought processes [13]. In addition, the scaffolding has supported the learning process step by step by students to solve the problems encountered. This is supported by the theory conveyed by Vygotsky that scaffolding must be done in the learning phase to solve the problem [12]. Furthermore, the implementation indicators can be mastered by students well. At the prettest and posttest values the implementation indicators are assessed from how the students create the observation table. Significant improvements from prettest to posttest with incomplete become complete category. The last indicator is monitoring, where in it there are questions to analyze the data of experimental results that have been done. This student still has difficulty in giving reasoning ability that states cause-effect. Students must have the ability to link the concepts they have in order to be able to analyze a data. Vygostky argues that in relating an individual's understanding is by connecting new knowledge with prior knowledge and can construct a new meaning [12]. The exercise of the students' training becomes familiar with the concepts found. So the value obtained increases, although it needs emphasis on exercise on monitoring indicators.

These improvements prove if the devices and instruments used can training problem solving skills. The learning model used is able to arouse students' curiosity, solve problems independently and improve thinking ability [12]. Students become able to think systematically. Learning is characterized by guided discovery trying to help students to learn how to learn effectively and efficiently [11]. For example they begin to be trained in indicators of problem representation, planning, and implementation. As for the monitoring indicators students still find it difficult. This is because the subject matter is discussed differently. Student problem solving skills look significantly improved from pretest to posttest after being treated. The increase is due in part to the guided discovery learning model as well because worksheet presents questions to stimulate them in active thinking.

All indicators are largely increased. Students discover the concept and principle through active involvement in learning that is proven through practice. Experiment activities are learning vehicles that can be used to train and develop students' thinking skills [14].

Students Responses

At the end of the study was given a questionnaire containing questions to find out the students' responses to learning by using guided discovery learning model to training problem solving skills. There are 13 positive question items. The response given by the students will be a reference to assess the level of interest and effectiveness of the application of guided discovery learning model to training problem solving skills. Total of 96.96% of students said they liked learning by using guided discovery learning model, then 100% of students stated that Guided Discovery Learning model helps in understanding the subject matter of factors influencing reaction rate. Students stated that experiment activity could make finding their own concept and principle with 96.96% percentage. 90.90% of students stated that learning with Guided Discovery Learning model is not considered difficult. Learning using guided discovery learning model can training problem solving skills to obtain percentage of students 100%. The problem solving skills can be well laid out and the percentage reaches 100%. Students said that training on worksheet can make it easier to understand the concepts taught and to practice problem solving skills with the acquisition of 100% percentage. As many as 100% of students find it helpful to understand the material through experiment activities. Experiment activities can make students participate actively as well as learning materials make a meaningful learning experience with the acquisition of a percentage of 93.93% and 90.90%.

CLOSURE

Conclusion

Based on analysis of research results that have been described, it can be concluded that:

1. Guided discovery learning model is implemented with percentage of > 61%
2. Student's problem solving skills after implementation the guided discovery learning model successfully trained from N-gain obtained increased in each indicator ie problem representation, planning, implementation and monitoring respectively of 0.92; 0.95; 0.96; 0.86.
3. Positive responses of students during the learning process on all questions earn a percentage of ≥ 90% are in very strong category

Recomendations

1. Training should be emphasized on monitoring indicators because students' reasoning is still not able to connect cause and effect.
2. Problem solving skills need to be trained using other learning models to find out the appropriate collaboration.
3. There is a need for further research using guided discovery learning model to training problem solving skills on other materials, so as to measure the extent to which guided discovery learning is effectively used in chemistry learning.

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